EcoHelpers

A service learning project of
Santa Monica Mountains National Recreation Area.

Teacher's Manual

NATIONAL PARK SERVICE

Acknowledgements

4th Edition, June 2009

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In 2002, the EcoHelpers program was initiated with a generous Whale Tail grant from the California Coastal Commission. The Commission's Public Education Program works to increase public knowledge of coastal and marine resources and to engage the public in coastal protection and restoration activities.

EcoHelpers has continued with federal grants from the Cooperative Conservation Initiative, Challenge Cost Share, and Public Land Corps programs, and a state grant from the California Coastal Conservancy. Grants are administered by the National Park Service and Mountains Restoration Trust. The Trust is committed to preserving, protecting, and enhancing the natural resources of the Santa Monica Mountains through land acquisition, cooperative planning, restoration, education, and recreational programs.

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Field Trip Overview

The EcoHelpers program teaches high school students the importance of maintaining healthy habitat. During the field trips, students learn how non-native invasive species affect wildlife and waterways. Each student will personally restore native plants to help improve the biodiversity and water quality at a national park site in the Santa Monica Mountains: Zuma Canyon (Malibu), Paramount Ranch (Agoura), or Rancho Sierra Vista (Newbury Park).

Arrival

You will arrive at the park site around 10:00am. A staff member will greet the students on the bus and provide **guidelines for a safe and enjoyable visit**. Students will then get a **short restroom break** before the program starts.

Ecology Lesson

At the picnic area, students will receive a **brief introduction to the park, a lesson on non-native invasive plant species, and the benefits of restoration to local wildlife.**

Interpretive Hike

Following the lesson, **students are divided into two groups and alternate between a planting activity and short, guided hike**, led by park staff. The hike is an excellent opportunity for the students see the park environment up close and learn basic concepts of ecology.

The trail travels through the five major plant communities of the Santa Monica Mountains: grassland, woodland, riparian, chaparral, and coastal sage scrub. Students see the biodiversity of these communities first-hand, and learn how plants have adapted to thrive in a Mediterranean ecosystem.

Restoration

At the restoration site, **students are given gloves and tools and instructed in the planting of native plants.** Students pick partners and plant a variety of species grown in the park's own native plant nursery.

Conclusion

After the planting activity and hike, the students are given **a short conclusion.** The full program lasts about 2 hours, not including lunch.

Lunch

Picnic facilities are available if your group wishes to stay for lunch, but food and beverages are not sold at the site. Your group will need to **bring their own lunches and drinks**. We also recommend that students **bring water for the hike and restoration work.**

Field Trip Preparation

Important Forms to complete and bring on the day of trip:

Volunteer Services Agreement – one per student, sent home in advance, middle section on Pg 1 filled out and signed/dated by parent or guardian.

Volunteer Services Agreement – one for each teacher and chaperone, top section on Pg 1 filled out, top section on Pg 2 signed and dated.

Group Volunteer Time **Sheet -** all students sign on morning of field trip.

Please use the forms provided in the confirmation packet. On the day of the field trip, a staff member will collect the forms before program begins. Please note that park policy requires that each individual and group complete these forms. **If forms are not completed, students can not participate.**

Clothing: Please advise students and chaperones to wear clothing appropriate for outdoor activities in variable weather conditions. Long pants, hats, jackets, and sunscreen are recommended. For their safety, students must wear closed-toe shoes.

Cellphones: Students may not use cellphones or other electronic devices during the program, unless under express permission of the school. Teachers/chaperones are also discouraged from use of these devices. Using cellphones/electronics during lunch is at the discretion of teachers and chaperones.

Cameras: Teachers and chaperones may use cameras during the program. However, student use of cameras is distracting and should be discouraged. Students are welcome to take pictures during their lunch period after the program has finished.

Rules: The group will be informed of all regulations at the beginning of the program. Students should be reminded that everything is protected within national parklands. **Picking flowers, collecting rocks, disturbing wildlife, etc. is prohibited**.

Safety: Potential hazards in the area include rattlesnakes, bees, ticks, and poison oak. Upon arrival, students will learn how to avoid these hazards and be alert to other safety concerns. Students with allergies should bring their medication, especially for bee stings. Planting activities and hiking may raise small amounts of dust and pollen.

Supervision

Teachers and chaperones are responsible for the proper behavior of students !!

Park staff are not expected to maintain discipline. Be sure that the chaperones are adequately dressed and wear durable shoes. They should be willing and able to supervise students and participate in all activities, including a short hike (1/4 mile).

Tool Safety: The students will be given a demonstration on the proper use of garden tools. Horseplay will not be permitted during the program, especially when working with garden tools. **If a student is disruptive or handles a tool in an unsafe manner, he/she will be removed from the activity**.

Questions? Please call the Program Coordinator at (805) 370-2314.

Service Learning Certification Form -- LAUSD

___ On Campus
_X_ Off Campus

SECTION 1

Instructor(s):	School
Course:	Department:
Period(s) Participating	Grade Level(s):
Project Name: **EcoHelpers**	Anticipated # of students:
	Date Submitted:

SECTION 2 Project Description:

While studying biodiversity and ecosystems, students will restore degraded areas in Santa Monica Mountains National Recreation Area. By pulling invasive weeds and planting native plants, they will improve the natural vegetation and encourage wildlife regeneration. Associated lessons will teach them about biodiversity in ecosystems and the impacts of invasive weeds.

SECTION 3 Community Need(s):

Both state and national parklands in the Santa Monica Mountains have been highly disturbed by the long-term activities of previous owners, such as animal grazing and exotic landscaping. With wide areas affected and limited park budgets, students can be an effective workforce while learning the basics of ecology.

SECTION 4 Community Partner(s):

U.S. National Park Service, LAUSD, Mountains Restoration Trust (a private land conservancy).

SECTION 5 Student Voice

Students will select their work partner or small team.
Student partners/teams will determine tool selection: hoes and shovels.
Students divide planting responsibilities: digging holes to correct depth, placing and planting native plants, clearing/digging surrounding wells, watering.

SECTION 6 California Content/Skill Standard(s)

Biology/Life Sciences, Grades 9-12: Ecology

6. Stability in an ecosystem is a balance between competing effects:
   a. Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
   b. Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of non-native species, or changes in population size.
   d. Students know how water, carbon, and nitrogen cycles between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.

History/Social Science, Grades 9-12: Historical Interpretation

5. Students analyze human modifications of landscapes and examine the resulting environmental policy issues.

SECTION 7 Project Components:

Students research the effects of non-native invasive species and pollutants on natural ecosystems.
Students learn basic ecology during a walk to restoration site.
Students remove invasive weeds and plant native plants to improve wildlife habitat.
Students discuss all aspects of their field trip with classmates.
Students complete worksheets during guided lessons before and after program.

SECTION 8 Reflection Prompts

Students will write about what they liked best about their field trip experience and why on the *Field Trip Review* assignment at school or as homework.

SECTION 9 Outcomes and Assessments:

Students will work with partners to accomplish planting of native plants.
Students will cooperate with larger team to remove specified weeds.
Students will understand the environmental benefits of native vs exotic plants.
Students will display writing and discussion skills in associated lessons.
Students will understand how ecosystems work and how they are affected by people.
Students will learn basic gardening skills and tool use.

SECTION 10 Accommodations/Support for Diverse Learners:

- Appropriate tasks will be assigned to all students.
- Students will be encouraged to work collaboratively and respect the talents of each of the members of their group.
- Locations will be accessible. When not available alternative sites will be sought.
- Each member of the group will have an equal opportunity to make significant contributions to the project.
- Students with IEPs will be identified and individual needs will be addressed.

I agree to the above accommodations for diverse service learners. Initials_____

SECTION 11 Administrator Comment(s) / Recommendations:

Submitted by: _____ Date:_____
Teacher Signature

Approved: _____ Date: _____
Principal or designee Signature

Original to: _____APSCS **Copies to:** _____ SIS Coordinator _____ Teacher(s)

Santa Monica Mountains National Recreation Area

"The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world."

–National Park Service Mission Statement

Santa Monica Mountains National Recreation Area protects the greatest expanse of the Mediterranean ecosystem in the National Park Service. The Mediterranean climate is characterized by hot, dry summers and relatively mild, wet winters. This unique ecosystem is found in only four other places in the world — central Chile, southwestern Australia, southern Africa and the Mediterranean Basin in Europe — comprising just 2% of the world's landforms.

The park is home to 26 distinct natural communities, from freshwater aquatic habitats and coastal lagoons to oak woodlands, valley oak savannah, and chaparral. It is a critical haven for nearly 500 vertebrate species, with 25 species listed as rare, threatened, or endangered. It also has over 1,000 archeological sites, one of the highest densities of archaeological resources found in any mountain range in the world. No other national park unit features such a diverse assemblage of natural, cultural, scenic, and recreational resources within easy reach of 10 million Americans of the Los Angeles area.

In 1978, Congress established Santa Monica Mountains National Recreation Area to be managed, "…in a manner which will preserve and enhance its scenic, natural and historical setting and its public health value as an airshed for the southern California metropolitan area while providing for the recreational and educational needs of the visiting public."

The park is preserved by a cooperative effort of over 70 governmental agencies, including the National Park Service, California State Parks, Santa Monica Mountains Conservancy, Mountains Restoration Trust, and California Coastal Commission. These agencies, along with private landowners, collaborate to provide places for people to live, work, and play while protecting the mountains and seashore for future generations.

Introduction to Non-native Invasive Species (NIS)

Definition. A **"non-native invasive species (NIS)"** is a foreign organism, transported to a new territory, that establishes, spreads, and causes ecological harm. NIS represent all taxonomic groups – plants, animals, and microorganisms. They are found on agricultural cropland and in natural and urban areas, and can be terrestrial or aquatic. Not all non-native species are "invasive."

Weeds. Non-native invasive *plants* are commonly called **"weeds."** Weeds: 1) grow rapidly 2) produce many seeds, and 3) lack predators in their new environment. Non-native invasive plants have been, and continue to be, introduced to the United States from foreign countries, either by accident or intentionally. Horticulture (nursery plants) and agriculture (food plants) are the main sources of non-native plants entering other countries. Some of these "escape" and become invasive weeds. Other accidental introductions occur when weed seeds are mixed with agricultural seed, or when seeds hitch on animals from other countries. In California, of the 1,045 non-native plant species that have become established, fewer than 10% are considered "invasive." Conversely, plants that are native to the United States have become weeds in other countries.

Ecological harm. When plants are removed from their native habitat and become established elsewhere, they may cause ecological harm to their new habitat. If the habitat has been disturbed by construction, fire, grazing, or farming, weeds out-compete native plants by using the water and nutrients essential for native seedlings to establish. Weeds often blanket large areas and reduce the diversity of plants in an ecosystem, thus reducing all other forms of life, from microorganisms to insects to mammals. The alteration or loss of habitat due to invasive species is a major concern for rare, threatened, and endangered species.

Solutions. Most weeds are very difficult to remove and require the physical removal of each plant, or treatment with herbicides. Other methods such as mowing help control weeds that are too numerous to eradicate. Following removal of weeds, restoration occurs by planting native plants that are mature enough to out-compete the weeds. State and national parks identify the weeds reducing native plant diversity and design removal and restoration plans accordingly. It is difficult to estimate the damage and cost of weed removal and restoration programs nationwide, but estimates range into the billions of dollars.

Restoring Parkland

The unique climate and diverse topography of the Santa Monica Mountains create a complex assemblage of vegetation communities including oak woodland, several types of chaparral, coastal sage scrub, valley oak savannah, grassland, riparian woodland, wetland, and coastal marsh. This vegetation diversity provides abundant habitat for wildlife: 50 species of mammals, close to 400 bird species, over 35 reptile and amphibian species, and thousands of invertebrate species. Native animals commonly seen in the Santa Monica Mountains include coyotes, bobcats, mule deer, rabbits, squirrels, mice and voles, woodpeckers, hummingbirds, hawks, western fence lizards, California newts, gopher snakes, and many others.

Although 90 percent of the park contains natural habitat, more than half of these areas are privately owned. The greatest threats to the park's natural resources are impacts associated with the transformation from natural open space to developed areas. An example is seen in the lower hills and coastal areas of the park, consisting primarily of coastal sage scrub. This plant community is considered one of the most highly disturbed communities in both the park and wider southern California.

The Santa Monica Mountains contain nearly 900 native plant species and 300 non-native species, such as mustard, fennel, and thistles. These non-natives often become invasive, causing native plants and wildlife to diminish or disappear. To increase biodiversity and help protect our natural resources, the National Park Service is working to restore vegetation in many areas of the Santa Monica Mountains.

The current EcoHelpers restoration sites at Zuma Canyon, Paramount Ranch, and Rancho Sierra Vista have a history of ranching and farming that has impacted the coastal sage scrub and other plant communities. To restore the sites, seeds are gathered from 20 local native plant species and grown to 1-gallon size at a park nursery, for students to replant.

Restoration of the Santa Monica Mountains requires a large and continual work force to accomplish the park's objectives. Your participation, and the collaborative efforts of volunteers and National Park Service staff, is not only restoring native vegetation, but improving wildlife habitat and water resources. In addition, the National Park Service is accomplishing a larger goal: educating our future protectors of the land and sea.

Program Theme and Goals

The EcoHelpers program is curriculum-based and focuses on science principles learned through hands-on restoration activities in a national park.

Theme

Plants are the Center of the Universe: restoring native vegetation improves wildlife habitat and water quality.

Goals

- Students will understand that non-native invasive plants can damage the natural communities that produce food and shelter to sustain native wildlife.
- Students will recognize that improving natural communities will improve native habitats, food chains, and the local food web.

Educational Standards

California Public Schools – Science Content Standards, Grades 9-12

Biology/Life Sciences: Ecology

- Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:

  6a. *Students know* biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.

  6b. *Students know* how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of non-native species, or changes in population size.

History/Social Science: Historical Interpretation

- 5. Students analyze human modifications of landscapes and examine the resulting environmental policy.

L.A. Unified School District – Student Learning Standards: Science

Upon completing two years of high school science in LAUSD, students will be able to:

- Analyze and explain the interdependence of organisms in ecosystems, the role of genetic inheritance, and the patterns and processes through which organisms and ecosystems change over time. (Life Science)

Upon graduation from LAUSD, students will be able to:

- Evaluate proposed solutions to challenges facing the earth and its inhabitants through the application and integration of the main concepts of the various branches of science. (Application and Connections)

Pre-trip Lesson: In a Chokehold

Time: 1 class period, or homework

Description: Students read article about the impacts of non-native invasive plants and complete a worksheet in class or as homework.

Goal: To introduce students to non-native invasive species and how they affect ecosystems.

Materials: "In a Chokehold" news article and worksheet, one each per student

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Procedure

- Hand out the article and worksheet.
- Define/explain difficult words and concepts from the article, including: **eradication, abatement, suppression, exotic or foreign species, fecundity, incremental, and insidious.**
- If given as class assignment, allow time for students to read article.
- Review the article with students, allow time for completion of worksheet.
- Correct the worksheet together, or evaluate as standard assignment.

Optional

- Use the "Introduction to Non-native Invasive Species (NIS)" as an outline for a teacher-led follow-up lesson or discussion.
- Present the discussion questions below.

Discussion

Ask students:

- What is biodiversity? Why is it important?
- What do native plants provide for wildlife?
- How are non-native species introduced to different parts of the world?
- How do non-native invasive species affect ecosystems?

Evaluate

- Worksheet
- Comprehension of concepts measured by participation in discussion.

In a Chokehold

California's native landscape is losing ground as aggressive imports run wild.

By Scott Doggett, Los Angeles Times, December 28, 2004

Southern California's environment is fast approaching the tipping point as an onslaught of foreign plants overwhelms efforts to protect the region's natural landscape.

In Los Angeles County, authorities warn that non-native plants, including pampas grass, arundo and yellow star thistle, have largely displaced many native species. More than 300 invaders have colonized the Santa Monica Mountains alone, says Christy Brigham, restoration ecologist for the Santa Monica Mountains National Recreation Area.

Since state funds dedicated solely for weed eradication dried up two years ago, the county Agricultural Commissioner's office has received $13,000 in grants from Sacramento in an attempt to continue with the abatement efforts, but the amount is less than half of what is needed to remove by hand one acre of arundo, a giant stream-choking plant. Other agencies also contract with county personnel to do eradication work.

Steve Schoenig, president of the California Invasive Plant Council, which tracks nonnative species statewide, estimates the cost to eradicate the region's worst plant pests at $20 million a year for a decade. Getting rid of all the invaders, he says, would cost nearly $1 billion. Private and federal funds provide $2 million to $4 million annually for control on public lands.

Despite some success – Orange County has beaten back pesky coastal algae – victories are few, and L.A. County officials say they are concentrating on containment of alien species rather than eradication. Yet, even that effort flags.

"We have a number of sites under suppression, but there are a lot of areas like Big Tujunga Canyon, Little Tujunga Canyon and places on the Westside where nothing is being done at all," says Jim Hartman, who heads the anti-invasive species program for the Agricultural Commissioner's office.

Across Southern California, non-native plants drain streams, add fuel for wildfires, replace wildflowers, drive out songbirds and ruin coastal sand dunes. Unchecked, scientists say people can expect fewer deer, birds and rabbits and less trout in streams as biologically diverse ecosystems give way to ho-hum weedscapes.

"Beautiful little wildflowers that we love – that make the spring such a great time here – will be gone. They can't compete with these mega-monster weeds," Brigham says.

Californians brought exotic plants here for yard decorations, freeway windbreaks and as food for people and livestock. Exotic species comprise nearly one-fifth of the plants in the state today. Among the most troublesome:

Algerian ivy. The fast-growing ornamental with big leaves easily surmounts barriers. “Go up Santa Anita Canyon out of Chantry Flats and toward Hogie’s Flat, you’ve got Algerian ivy that runs right up the watercourse. It’s so dense in there that it just suppresses everything else and it’s growing up into the trees. It’s a biologic disaster,” Hartman says.

Salt cedar and perennial pepperweed. Their roots concentrate salt in soil, killing other plants. Pepperweed occurs near Gorman and Malibu Creek while salt cedar is widespread in washes.

Yellow star thistle. A rancher’s nightmare, the weed overtakes pasture, robs livestock of food and is extremely difficult to remove. It infests about 22 million acres in California and causes $60 million in water and grazing losses, experts say. Once it colonizes slopes, its shallow roots don’t keep soil stable, making canyons vulnerable to mudslides.

Geraldton carnation spurge. This tall European weed with tiny yellow flowers and sticky white sap has “spread like crazy” on the Malibu Bluff at the expense of native forage for deer, rabbits, and insects, Brigham says.

The sheer fecundity of these plants often outraces bureaucracy. The Copper fire near Santa Clarita in 2002 burned arundo to the nub in San Francisquito Canyon, but in the two months it took to secure permits to remove it, Hartman says, the plant had grown back and was more than 4 feet high, doubling removal costs.

The invaders spread incrementally, and by the time authorities notice trouble, it’s often too late to stop it.

“Invasive weeds aren’t seen as the problem that they truly are,” Hartman says. “A lot of these species are insidious. They creep slowly in places and you don’t know how bad they are until all of a sudden they are everywhere. Then you notice that the wildlife isn’t there.”

Name: _____ Date: _____

Class/Period: _____

Worksheet: In a Chokehold

1) More than (50 / 100 / 300) non-native plants have invaded and colonized the Santa Monica Mountains.

2) _____ is a giant, stream-choking, non-native plant.

A) bamboo B) sycamore C) cottonwood D) arundo E) willow

3) Why do people bring exotic plants to California? (circle three)

A) yard decoration B) food for people C) fire D) food for livestock

4) True / False Non-native invasive plants (weeds) increase the biological diversity in ecosystems, such as wildlife.

5) According to Christy Brigham, native wildflowers "can't compete with these mega-monster _____."

A) rains B) mushrooms C) weeds D) birds

6) Experts estimate that in California, the yellow star thistle weed alone causes _____ in water and grazing losses.

A) $60 million B) no damage C) $2 million to $4 million D) $100

7) True /False By the time authorities notice that weeds are causing problems, it is often too late to stop it.

8) Non-native invasive plants in California include:

A) arundo B) yellow star thistle C) pampas grass D) Algerian ivy E) all of these

9) Across Southern California, weeds: (circle all that apply)

A) drain streams B) replace wildflowers C) benefit native wildlife

D) drive out songbirds E) increase biodiversity F) ruin coastal sand dunes

10) Once a fire or construction disturbs native habitat, how do you think ecologists can protect native plants from weeds? Give at least two methods of action.

_____

_____

Name: _____ Date: _____

Class/Period: _____

Answers: In a Chokehold

1) More than (50 / 100 / **300**) non-native plants have invaded and colonized the Santa Monica Mountains.

2) _____ is a giant, stream-choking, non-native plant.

A) bamboo B) sycamore C) cottonwood D) **arundo** E) willow

3) Why do people bring exotic plants to California? (circle three)

A) **yard decoration** B) **food for people** C) fire D) **food for livestock**

4) True / **False** Non-native invasive plants (weeds) increase the biological diversity in ecosystems, such as wildlife.

5) According to Christy Brigham, native wildflowers "can't compete with these mega-monster _____."

A) rains B) mushrooms C) **weeds** D) birds

6) Experts estimate that in California, the yellow star thistle weed alone causes _____ in water and grazing losses.

A) **$60 million** B) no damage C) $2 million to $4 million D) $100

7) **True** /False By the time authorities notice that weeds are causing problems, it is often too late to stop it.

8) Non-native invasive plants in California include:

A) arundo B) yellow star thistle C) pampas grass D) Algerian ivy E) **all of these**

9) Across Southern California, weeds: (circle all that apply)

A) **drain streams** B) **replace wildflowers** C) benefit native wildlife

D) **drive out songbirds** E) increase biodiversity F) **ruin coastal sand dunes**

10) Once a fire or construction disturbs native habitat, how do you think ecologists can protect native plants from weeds? Give at least two methods of action.

Pull and spray weeds, plant native plants, prevent disturbance, educate hikers about weed-spread, others as apply.

Name: _____ Date: _____

Class/Period: _____

Field Trip: Review 1

1) Plants are primary: A) producers (B) consumers (C) decomposers

2) True / False **Invasive weeds** provide good shelter and food for native animals.

3) The _____ of the Santa Monica Mountains used plant parts for food, medicine, tools, weapons, and almost every other aspect of their lives.
   A) Navajo B) birds
   C) insects D) Chumash

4) Fill in the blanks using these words. (One word will not be used.)

native	climate	biodiversity	Weeds (non-native invasive plants)	ecosystem

   _____ have negative affects on ecosystems because they reduce the _____ of _____ plants and animals in an _____ .

5) True / False The Santa Monica Mountains ecosystem has the second highest **biodiversity** in the world.

6) **Primary consumers** are animals that eat plants. Circle three examples of primary consumers in the Santa Monica Mountains:

   bobcat *mouse* *red-tailed hawk* *fence lizard* *deer* *grasshopper*

7) The restoration site at Zuma Canyon is an example of what type of **disturbance**?
   A) farming and ranching B) housing development
   C) earthquake D) fire

8) Name another national park that you would like to visit, and why:

   _____

   _____

9) Which of these contribute to loss of **biodiversity**? Underline all that apply.
   A) Global warming B) Restoration projects
   C) Housing development D) Invasive plants and animals

10) What did you like best about the field trip? Why?

   _____

   _____

   _____

Name: _____ Date: _____

Class/Period: _____

Answers: Review 1

1) Plants are primary: A) **producers** (B) consumers (C) decomposers

2) True / **False** Invasive weeds provide good shelter and food for native animals.

3) The _____ of the Santa Monica Mountains used plant parts for food, medicine, tools, weapons, and almost every other aspect of their lives.
   A) Navajo B) birds
   C) insects D) **Chumash**

4) Fill in the blanks using these words. (One word will not be used.)

native	climate	biodiversity	Weeds (non-native invasive plants)	ecosystem

Weeds have negative affects on ecosystems because they reduce the **biodiversity** of **native** plants and animals in an **ecosystem** .

5) **True** / False The Santa Monica Mountains ecosystem has the second highest biodiversity in the world.

6) Primary consumers are animals that eat plants. Circle three examples of primary consumers in the Santa Monica Mountains:

   bobcat *mouse* *red-tailed hawk* *fence lizard* *deer* *grasshopper*

7) The restoration site at Zuma Canyon is an example of what type of **disturbance**?
   A) **farming and ranching** B) housing development
   C) earthquake D) fire

8) Name another national park that you would like to visit, and why:

   (name of national park, and why)

9) Which of these contribute to loss of biodiversity? Underline all that apply.
   A) **global warming** B) restoration projects
   C) **housing development** D) **invasive plants and animals**

10) What did you like best about the field trip? Why?

    (accept positive answers)

Name: _____ Date: _____

Class/Period: _____

Field Trip: Review 2

For questions 1 to 4, refer to Figure 1 below.

1) Name two of the **top predators** in Figure 1:

_____

2) Deer, insects, and rabbits are all primary consumers. What does the term **primary consumer** mean?

_____

3) What types of organisms are always at the base of **food chains**?

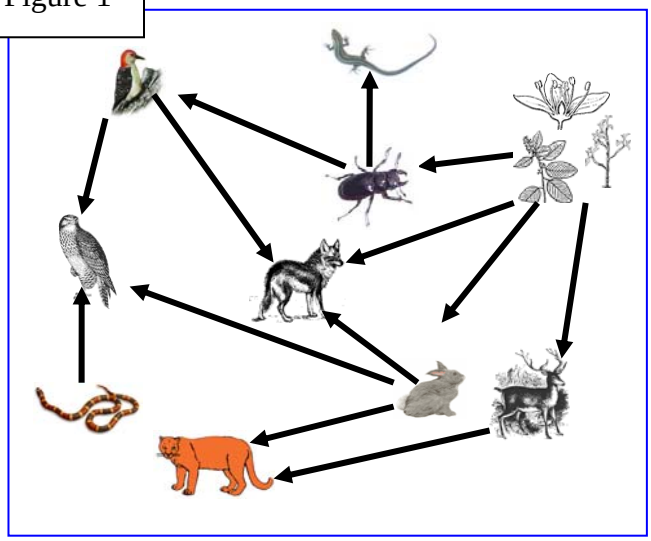
_____

4) What would happen to the **ecosystem** if the insects were removed? Explain.

_____

_____

Figure 1



5) Non-native invasive plants (weeds) are harmful to **ecosystems**. Name some of the negative effects to ecosystems.

_____

_____

_____

_____

6) Half of the land in the Santa Monica Mountains is privately owned. If all of this land were developed with houses and shopping centers, how would it affect the **biodiversity** of native plants and wildlife?

_____

_____

_____

7) Brainstorm three ways that we can help preserve the **biodiversity** of plants and animals that live in water and on land.

_____

_____

_____

Name: _____ Date: _____

Class/Period: _____

Answers: Review 2

For questions 1 to 4, refer to Figure 1 below.

1) Name two of the top predators in Figure 1:

mountain lion (or cougar, puma, panther), hawk, coyote

2) Deer, insects, and rabbits are all primary consumers. What does the term primary consumer mean?

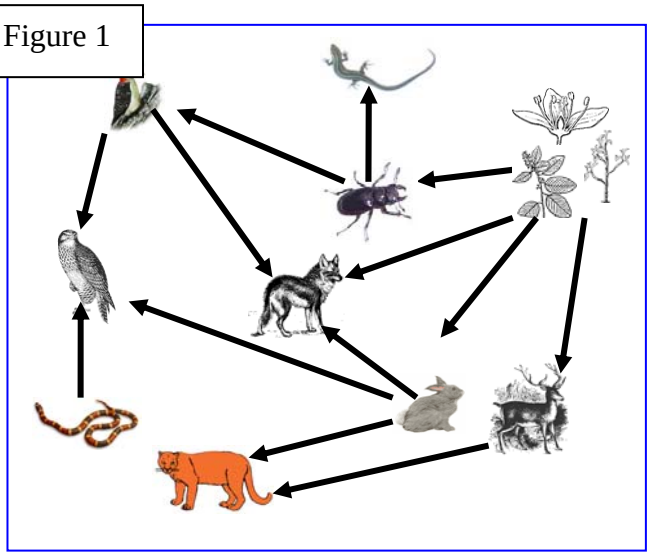
an animal that eats plants

3) What types of organisms are always at the base of food chains?

plants

4) What would happen to the ecosystem if the insects were removed? Explain.
Plants would not be pollinated; less organic matter would decompose; plant diversity would be imbalanced (too many/too few); animal food source gone.

Figure 1



5) Non-native invasive plants (weeds) are harmful to ecosystems. Name some of the negative effects.
Native seedlings are out-competed and numbers diminish; native animals lose their sources of food and shelter.

6) Half of the land in the Santa Monica Mountains is privately owned. If all of this land were developed with houses and shopping centers, how would it affect the biodiversity of native plants and wildlife?

Biodiversity would decrease; certain species could become rare, endangered, or extinct; animals would have to relocate, creating population stress.

7) Brainstorm three ways that we can help preserve the biodiversity of plants and animals that live in water and on land.
Protect and restore habitat; don't remove or disturb habitat; cut pollution (especially in home environment); reduce reuse, recycle; use native plants in landscaping.

Post-trip Lesson: The Case of the Euphorbia

Time: 1 to 2 class periods

Description: Students participate in small group debates on how to eradicate a non-native invasive plant in the Santa Monica Mountains. Acting as members of different interest groups, students will respond to opposing views. The groups will then create a compromise solution to the issue.

Goal: Students will understand the complexity of environmental issues and the difficulties of compromise.

Materials: Scenario sheet – 1 copy per group
Role Cards – make enough copies for 1 role/student, cut copies into strips.

Procedure

- Divide your class into small groups, five to seven students each.
- Hand out one Scenario to each group, explain as fictional but realistic scenario.
- Teacher reads the Scenario aloud to the class (or asks students to read). Explain anything that may be confusing, including vocabulary words.
- Call for a pre-vote on the three options by raise of hands, tally the results.
- Hand out one role card (strip) per student, all different roles in each group.
- Remind students to assume the view/values of interest group during discussion.
- Each group presents its preferred solution to class, with justifying viewpoints. Option: groups write down their solution and views, teacher reads them.
- A student or teacher writes down any new solutions on the board.
- Students vote again on original options and new solutions, tally, compare.

Read directions to students or write on board:

1) By vote, pick a group moderator to take notes and set discussion rules.
2) Read role card silently, pick solution that goes with role, or create better solution.
3) On the back of your role card, write your name and solution you picked or created.
4) Going around your group, students read role cards aloud to others in group.
5) As a group, discuss the pros and cons of Scenario solutions, justify your opinions.
6) By vote, each group agrees on a solution or compromise to the issue.
7) Choose a spokesperson to share group's solution with class, and why it was chosen.

Class Discussion

1) What was difficult about taking on the viewpoints of your interest group?
2) How does your own view differ with or resemble your interest group? Why?
3) Did your opinion change from the first vote to the second? Why or why not?
4) Did all interest groups have voices heard? Name other possible interest groups.
5) Were some voices heard over others in your group? Why?
6) Who should decide this issue: the community, the experts, or both? How?
7) What can be done to create more balanced decisions about community issues?

Self-evaluate

On back of role cards, students rank their level of interest from 1 to 5 (low to high).

The Case of the Euphorbia: Scenario

Euphorbia is a **non-native invasive** plant species that was introduced to the United States from Spain and has now made its way to the Santa Monica National Recreation Area in southern California. In disturbed areas, this plant out-competes native plants by taking the water, nutrients, and sunlight essential for native seedlings. Common disturbances include construction, fire, and grazing. Euphorbia produces many seeds and is very difficult to remove. It is reducing the diversity of plants in local areas within the Santa Monica Mountains. Reducing the plant diversity in an ecosystem can impact all other forms of life, from microorganisms to insects to mammals.

Park scientists must decide how to control or eradicate Euphorbia to reduce its impacts on **biodiversity** and keep it from spreading throughout the mountains. The National Park Service has called a Community Meeting so the public can comment on these possible solutions:

1) Remove each plant physically.

How: with a few people over a long period, or with many people over a short period.

- Positives: no chemicals are used
- Negatives: very labor intensive and expensive
  may cause soil disturbance that encourages other weeds

2) Apply herbicide to plants.

How: apply weed killer by spraying each plant, or with tractors spraying wide areas.

- Positives: much swifter and cheaper than hand-pulling
- Negatives: chemicals may affect water, native plants, and animals

3) No action.

- Positives: doesn't cost anything
- Negatives: Euphorbia will spread and continue to reduce biodiversity

Definitions

biodiversity: variety of life in an area, usually measured as the number of species of plants and animals.

non-native invasive species: a foreign organism, transported to a new territory, that is able to establish, spread, and cause ecological harm.

native: a species that has adapted to local conditions over thousands of years.

The Case of the Euphorbia: Role Cards

**Cut cards and distribute.*

Environmental Action Team *You are the Director of a small non-profit agency located in Los Angeles. You oppose the herbicide solution because you feel that the city water supply may be damaged. A contract with a local company may contribute to the economy, but you feel residents should not have to risk their health for jobs.*	**Mayor's Office** *You are a representative of the Mayor's Office. From your viewpoint, the local company most likely to get the herbicide contract needs the business. You support any plan to bring jobs to the community. You also believe the company's claims that there will be no environmental damage.*
Dog Owner *You walk your dog every day in the park. There are very few parks where dogs are permitted. You would prefer that park funding be used for restrooms, benches, and trail improvements instead of the removal of Euphorbia.*	**Landscape Historian** *You feel that Euphorbia should be left alone as a tribute to a part of local history. You feel that non-native plant communities could be used as teaching tools to help people understand more about the people and cultures that brought the plants.*
University Professor of Ecology *You support the park's efforts to restore native plant habitat. You bring your classes to the Santa Monica Mountains to help them understand the significance of diversity and the balance of nature that must be restored. Your research shows that the herbicide used on Euphorbia does not pollute ground water or harm wildlife if applied properly.*	**Eco-Club President** *You are the President of a nation-wide environmental organization. You have over 150,000 members across the country and an operating budget of $75 million. You are convinced that all herbicides have negative effects on wildlife, but you haven't researched this particular herbicide.*

Hiker *You are the parent of three young children. Your family visits the Santa Monica Mountains often. You enjoy the views and identifying native plants along the trails. You are concerned that weeds are overrunning native wildflowers and reducing wildlife.*	**Volunteer** *You have volunteered for the National Park Service for ten years, ever since you were studying Environmental Science in college. You support the park's efforts to restore native plant habitat, but are undecided whether herbicides are a good idea. On one hand, it is cost effective compared to hand-pulling Euphorbia. On the other, you are concerned that the herbicides may cause harm to the ecosystem.*
Health Care Professional *You are concerned about the potential long-term health problems caused by chemicals in the environment.*	**Scientist Hired by the Herbicide Company** *You work for the company that produces the herbicide. Your research shows little if any harmful effects to the ecosystem from using this herbicide. You believe the herbicides will wipe out Euphorbia and leave the area safe for native species.*
Artist *You are an artist and teach art classes. You have been bringing students to the Santa Monica Mountains for many years. Your favorite time of year is when there are fields of yellow Mustard flowers. Even though the Mustard is a weed like Euphorbia, you don't support any plant removal because many "weeds" are perfect subjects for beginning artists.*	**Student** *You are a local student. You came to the meeting today because you are interested in the future of your national park. You are willing to listen to all the alternatives with an open mind and then give your opinion about the use of herbicides in the Santa Monica Mountains.*

Teacher Resources

Websites

Organization	Web Address	Description
Invasive Species		
Audubon Society	audubon.org/campaign/invasives/index.shtm	Describes what invasive species are and what they do.
CA Dept of Fish and Game	dfg.ca.gov/hcpd	Invasive species list/info – see *Threats,* then *Animal and Plant Info,* then *Invasive, Nuisance and Exotic Species.*
CA Dept of Food and Agriculture	cdfa.ca.gov	News and info on weeds – see *encycloweedia* and *weed education.*
Sonata, Inc.	weedinvasion.org/weeds/weed_home.php	*Alien Invasion: Plants on the Move* – K-12 lessons, teacher resources.
California Information Node National Biological Information Infrastructure	cain.nbii.gov invasivespecies.nbii.gov	California's invasive species resources. Invasive species examples and resources.
California Invasive Plant Council	cal-ipc.org	Restoration, research, and education; rating scale of harmful invasive plants.
University of California, Davis	axp.ipm.ucdavis.edu/pmg/weeds_common	Department of Entomology's weed photo gallery.
National Park Service	nps.gov/samo	Links to local/national invasive species info, curriculum, and resources.
Native Plants		
CalFlora	Calflora.org	Info on native and non-native plants.
California Native Plant Society	cnps.org	Mission is to conserve and appreciate California's native plants.
Conservation.Org	conservation.org	Conserving natural heritage, biodiv.
Science		
McDougal-Little	classzone.com	Science textbook resources.
Ecological Society of America	tiee.ecoed.net	*Teaching Issues and Experiments in Ecology* – hands-on labs and lessons.
National Science Teachers Association	nsta.org	Promoting excellence in science teaching.

Books

Title	Bibliography	Description
Invasive Ecology: Teachers Guide	National Science Teacher Association, 2003.	Textbook on invasive ecology with hands-on data collection projects: data sheets, rubrics, and background information.
Flowering Plants of the Santa Monica Mountains	Dale, Nancy. Capra Press, 1986.	Detailed descriptions and photos of native plants and plant communities in the Santa Monica Mountains.
Plant Life in the World's Mediterranean Climates	Dallman, R. Peter. California Native Plant Society, University of California Press, 1998.	Describes and compares the five Mediterranean climate ecosystems; discusses plant adaptations and plant communities.
Growing California Native Plants	Schmidt, G. Marjorie. University of California Press, 1980.	A guide on how to grow California native plants.
Atlas of the Biodiversity of California	State of California, Department of Fish and Game, 2003.	A general overview of the many aspects of biodiversity in California.

Videos - order online or check your local library or video store

Title	Producer	Description
The Secret Life of Plants	Turner Broadcasting Co. (1979) 60 minutes.	Shows relationships between insects and plants, and amazing plant adaptations.
Secret of Life On Earth	Warner Home Video (2003) 60 minutes.	Documentary on plants.
Bill Nye the Science Guy: Biodiversity	Disney Educational Productions (1994) 26 minutes.	Entertaining video about the impact of humans on ecosystems.
Biodiversity for Forests and Farms	Cornell University (1996) 26 minutes.	Interviews with farmers, ecologists, and forest owners about protecting and enhancing biodiversity.
Introduction to Biodiversity – Part 1 of 5-Part Series: Natural Connections	Bullfrog Films (1999) 15 minutes.	Introduces biodiversity and takes a close look at salmon, rainforests, and marine ecosystems as examples; winner of 5 Emmy awards, study guide available.

Glossary of Terms

abiotic factors: non-living parts of an organism's environment; examples: temperature, air currents, moisture, light, and soil.

adaptation: evolution of a structure, behavior, or internal process that enables an organism to respond to environmental factors and live to produce offspring.

annual: anthophyte (flowering plant) that lives for one year or less.

biodiversity: variety of life in an area, usually measured as the number of plants and animals.

biotic factors: all the living organisms that inhabit an environment.

ecosystem: interactions among populations in a community; the community's physical surroundings, or abiotic factors.

food chain: simple model that shows how matter and energy move through an ecosystem.

food web: model that shows all the possible feeding relationships at each trophic level in a community.

habitat: place where an organism lives out its life.

non-native invasive species (NIS): a foreign organism, transported to a new territory, that is able to establish, spread, and cause ecological harm.

native: a species that has adapted to local conditions over thousands of years.

perennial: anthophyte (flowering plant) that lives for several years.

seedling: a young plant, grown from a seed.